DOCUMENT RESUME

ED 449 614 EC 308 220

AUTHOR	Nevin, Ann, Ed.
TITLE	Essential Elements of Instruction: Lesson Plans Created by Special Education Interns, Fall 2000.
INSTITUTION	Arizona State Univ.-West, Phoenix.
PUB DATE	2000-00-00
NOTE	36p.
PUB TYPE	Guides - Non-Classroom (055)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	*Arithmetic; Elementary Secondary Education; *Learning Disabilities; Learning Strategies; *Lesson Plans; *Mathematics Instruction; Mild Mental Retardation; Mnemonics; *Teaching Models
IDENTIFIERS	*Essential Elements of Instruction (Hunter)

ABSTRACT

This document is a collection of six mathematics lesson plans for use with students with learning disabilities or mild mental retardation. The lesson plans utilize the Essential Elements of Instruction (EEI) 5-Step lesson design model developed by Madeline Hunter. The lesson plans and their authors are as follows: (1) "An EEI Lesson for 1st Graders with Learning Disabilities in Math: The 'Say It before You Do It' Strategy" (Jacqueline Katsoufis, Amanda Libby, and Lina Nguyen); (2) "An EEI Lesson for 2nd [and] 3rd Grade Students with Learning Disabilities in Math Reasoning and Computation: The 'Say-Do' Strategy" (Diane Martin-Snyder, Nichole Pottinger, and Priscilla Romero; (3) "An EEI Lesson for 3rd-5th Grade Students with Learning Disabilities: The 'Say-Do' Strategy To Improve Multiplication" (Daniel Coburn, Beth Harrison, Cheryl Martin); (4) "An EEI Lesson for 7th-8th Grade Students with Learning Disabilities in Reading Comprehension: Using the RIDGES Mnemonic To Solve Story Problems in Math" (Rebekah Dyer, Nancy Kane, and Julia Monoz); (5) "An EEI Lesson for 9th Grade Students with Mild Mental Retardation: Using Mnemonics Strategies To Solve Math Word Problems RIDGES and 'Does McDonalds Sell Cheese BurgeRs?'" (Ann Calvert, Serena Comella, and Susan George); and (6) "An EEI Lesson for 10th Grade Students with Specific Learning Disability in Mathematics and Who are Learning English as a Second Language: Using Mnemonics for Problem Solving" (Kelly Buck, Annemarie Lampright, and Donald Rand). An appendix outlines the EEI lesson design model. (DB)

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Essential Elements of Instruction

Lesson Plans

Created by

CONNECTING THE PIECES

Special Education Interns
Arizona State University West
Phoenix, Arizona
Fall 2000

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The lesson plans* in this document were collaboratively developed and edited by
Dr. Ann Nevin
and
Fall 2000 Special Education Interns
in partial fulfillment of the requirements for
SPE 323: Technology and Instructional Methods for
Students with Cross Categorical Special Needs
Arizona State University West, College of Education, Phoenix, AZ.

Submitted to Resources in Education.
Educational Resources Information Clearinghouse (ERIC).
ERIC Document # *pending*.

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An EEI Lesson for 1st Graders with Learning Disabilities in Math:
The "Say It Before You Do It" Strategy
by
Jacqueline Katsoufis, Amanda Libby, and Nina Nguyen

Note: This lesson is designed to **meet the learning needs and special characteristics of students with learning disabilities in mathematics** at the first grade level, specifically providing step-by-step instruction on age-appropriate academic tasks with frequent review, frequent opportunities for success by providing prompt and specific consistent feedback, and accommodating for visual, auditory, and kinesthetic learning styles. **Self determination components** include taking risks, being creative, accessing resources and support, realizing success, and being self-regulatory with regards to hearing and seeing and then correcting errors in addition. For those who are also learning English as a Second Language, **SDAIE (**Specifically Designed Academic Instruction in English) strategies include encouraging students to communicate in English using familiar vocabulary and sentence structures.

Arizona Standard: Mathematics Standard 1: Number Sense

IM-F3: Understand the meaning for and application of the operations of addition, subtraction, multiplication, and division.

PO 1. Demonstrate with models to show the process used in addition.

Short Term Instructional Objective: Given the "Say It Before You Do It" tactic, the students will practice addition with this method on worksheets provided by the teacher, 3 times a week, for a 3-week period of time. At the end of the 3-weeks, the students will score 85-100% accuracy on a teacher made test consisting of 20 addition questions within a 15-minute time period.

ANTICIPATORY SET

Ask the students, "What is addition?" (Accept 2 to 3 answers randomly.)

Tell the students, "Do you want to be smarter when you do addition? Today you will be learning addition with the Say-It-Before-You-Do-It method. This method helps you be smarter in math addition because you can see or hear your own mistakes and correct them. Say YES if you are READY TO LEARN Say-It-Before-You-Do-It!"

INSTRUCTION

1. You will be saying your math problems out loud before you write anything down.
2. In each problem on your worksheet you see a box or blank space in the problem. This represents the missing number that you should fill in.
3. You will need to use what you already know about addition (such as counting out the number which corresponds to the numeral, physically using your number sticks or number line to add, using the number line on your desk, or using tally marks).
4. Model: **Watch and Listen as I Show You *Say-It-Before-You-Do-It*!**

"The problem is ____ + 3 = 10.
Hmmm, What am I going to do first with this problem?
I'm going to 'read' it. "What number added to the number 3 equals the number 10? Hmmmm….I'm going to use my fingers to count….
I'm going to start with 3 and when I get to 10, then the number of fingers will be what I write in the blank space.
Let me see…."3" (use fingers to show counting out)…4,5,6,7,8,9, 10.
Now, how many fingers have I counted out? (Show the 7 fingers).
Let me say the numbers out loud as I count these fingers. 1, 2, 3, 4, 5, 6, 7.
OK…Now I'm going to write the number 7 in the blank space (or box).
OK…Let me check this.
Does seven added to three equal ten?
Here's one way I can check. I can use my number line by finding 7 on the number line and adding 3 more (8, 9, 10) Aha—YES seven added to three equals ten!"

CHECK FOR UNDERSTANDING (elicit overt active participation devices)

1. What does the box or blank space in your problem represent?
(Praise approximations to the correct answer, provide correct answer.)
2. Use your own words to tell your partner sitting next to you what you will do when you use the Say-It-Before-You-Do-It.
(Circulate to each partner team to eavesdrop and hear what students say.)
3. Use Example and Non Example.
Let's practice now. Here's one problem I'll do in my head. You won't be able to hear me think out loud. (Do it silently.)
Here's another problem we'll do outloud together. You'll be able to hear and watch as we do it together. (Do it outloud letting the children call out instructions.)

CLOSURE

Assessment of Objective: The Monitoring System consists of the teacher graphing the data collected from the 3-week practice worksheets, showing the graphs to the students to indicate progress (or lack of progress) for each individual. In the case of no progress, the teacher and the student will re-evaluate the Say-It-Before-You-Do-It method to check that it is being implemented correctly and to determine any changes to make (such as switching to a different tactic).

INDEPENDENT PRACTICE

For the next 3 weeks, students will be given teacher made worksheets and time in class to practice the Say-It-Before-You-Do-It method with their math addition problems. During the practice session, the teacher will eavesdrop to monitor the implementation of the Say-It-Before-You-Do-It method. The worksheets will be collected and accuracy will be graphed.

References

Arizona Department of Education. (2000). Arizona Standards in Math: Number Sense. Retrieved from WWW Nov. 2, 2000. http: ade.state.az.us standards math standard1.htm

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NAME _____ DATE _____ SCORE _____

Directions: Solve each problem, step-by-step, using ***Say-It-Before-You-Do-It!***
Fill in the _____ with the correct number.

1. ____ + 3 = 10
2. ____ + 0 = 10
3. ____ + 4 = 10
4. ____ + 5 = 10
5. ____ + 9 = 10
6. ____ + 2 = 10
7. ____ + 6 = 10
8. ____ + 8 = 10
9. ____ + 1 = 10
10. ____ + 7 = 10
11. ____ + 7 + 10
12. ____ + 0 = 10
13. ____ + 6 = 10
14. ____ + 5 = 10
15. ____ + 1 = 10
16. ____ + 8 = 10
17. ____ + 4 = 10
18. ____ + 2 = 10
19. ____ + 9 = 10
20. ____ + 3 = 10

An EEI Lesson for 2nd-3rd Grade Students with Learning Disabilities in Math Reasoning and Computation: The "Say-Do" Strategy

by

Diane Martin-Snyder, Nichole Pottinger, and Priscilla Romero

Note: The lesson is designed to help young elementary students with learning disabilities in math reasoning and computation as they are moving from the acquisition stage of learning to the automatic or proficiency stage of learning math skills. Generalization in the form of applying math concepts that have been learned is a by-product of the lesson. **Self determination** skills are practiced by virtue of the increased self awareness and resulting self confidence that comes when a student becomes more self-regulated with regards to recognizing and correcting his/her own errors. Because the students are also the lesson includes **SDAIE (**Specifically Designed Academic Instruction in English) strategies such as typically acquiring English language, matching language with experience and asking questions, giving directions, and advancing students to higher levels of Bloom's Taxonomy (from recalling to evaluating).

Arizona Standard Mathematics Standard 1: Number Sense Students develop number sense and use numbers and number relationships to acquire basic facts, to solve a wide variety of real-world problems, and to determine the reasonableness of results.

FOUNDATIONS (Grades 1-3)

PO 2. Demonstrate with models to show the process used in subtraction (takes away, compares, finds the difference, decreases).

PO 3. Construct equivalent forms of whole numbers (e.g., 15 + 5 = 10 + 10)

1M-F3.Understand the meaning for and application of the operations of addition, subtraction, multiplication and division

PO 6. Select appropriate operations to solve word problems

Short Term Instructional Objective: Students participate by stating what they think when they solve a math problem at 80-100% accuracy, given 18 subtraction problems in one class period, as observed by the teacher.

ANTICIPATORY SET

Ask in an enthusiastic tone. *"What do you think about when you see subtraction problems like this?"* as you write on the board in large numerals any one of the subtraction problems in both vertical and horizontal columns. For example:

(?) - 4 8	____ - 4 = 8

Accept all answers (e.g., groans, I hate subtraction, I'm confused, I think about taking away, I think about my allowance, etc. etc.)

Say, Today you'll be learning a really neat way to improve how you do subtraction problems like this! You'll learn how to figure out what to do when you might make a mistake.

INSTRUCTION

Pre Test You have 15 minutes to complete these 18 problems. Do the best you can. I'll let you know when time is up.

When the time has elapsed, say, Thank you. I'll check your answers and then we'll decide what is the best tactic for you to learn to help you improve this skill.

Note: The pre test is needed for the teacher to determine the type of errors the students might be making BEFORE teaching the "Say-Do" tactic.

Two types of errors might be made, A or B. Style A errors = misses few and misses are random.

Model the Say-To Tactic: Have the student take the test again, but this time, have the student verbalize each problem before writing the answer.

Say, "Please talk out loud as you write these problems and think about what the answers will be." The teacher listens for correct syntax in 'reading' the problem. For example, for the ____ the student might say "What number" and for the subtraction symbol (-) the student might say "minus," and for the equals sign (=) the student might say (is the same as, or equals). If the incorrect syntax is used, the teacher immediately provides the correct word usage.

Monitor as the students complete the new practice examples. Check for understanding.

Score and record the data. Student continues taking the test and after several more trials if the score improves say to the student: "Only think about the numeral and the operation instead of saying it out loud."

The goal is for the automatic stage (proficiency) where the numerals, operation, process, and answers are automatic or rote.

Style B errors = predictable misses (for example, doesn't know 9's).
Model the Say-Do Tactic: Same procedure but the student verbalizes only the problems missed.

Say, "Only talk out loud as you write these problems and think about what the answers will be".

The teacher listens for correct syntax in 'reading' the problem. For example, for the ____ the student might say "What number" and for the subtraction symbol (-) the student might say "minus" and for the equals sign (=) the student might say (is the same as , or equals). If the incorrect syntax is used, the teacher immediately provides the correct word usage. Teacher highlights or circles the previous errors before student verbalizes them.

Continue to retest and document the errors. Monitor as the students complete the problems. Check for understanding.

If scores improve, the new goal is to go to "think" stage and finally to automatic stage (proficiency).

CLOSURE

Show students the results of their practicing with the Say-Do tactic.
Ask students to summarize the tactic.
Say positive statements about their ability to use the tactic to make corrections. Say, "You did a great job on this new skill!"

INDEPENDENT PRACTICE

Give the students new subtraction examples to practice. Encourage them to use the "Say-Do" tactic for solving other types of problems (look for generalization, for example, if they have some addition problems to complete. Expect them to use the Say-Do tactic there as well!)

References

Arizona Department of Education. (2000). Arizona Standards in Math: Number Sense. Retrieved from WWW Nov. 2, 2000. http://ade.state.az.us/standards/math/standard1.htm

Hunter, Madeline. (1982). Mastery teaching. California: Corwin Press, Incorporated. (ISBN: 0803962649)

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NAME OF STUDENT _____ **DATE** _____ **SCORE** ____

Directions: Complete as many of the following problems within 5 minutes. Your goal is 95%-100% accuracy!

1. ____ - 4 = 8	2. ____ - 4 = 2	3. ____ - 6 = 2	4. ____ - 7 = 2
5. ____ - 7 = 1	6. ____ - 4 = 1	7. ____ - 1 = 7	8. ____ - 1 = 2
9. ____ 1 = 3	10. ____ - 5 = 4	11. ____ - 7 = 6	12. ____ - 5 = 3
13. ____ - 3 = 2	14. ____ - 3 = 4	15. ____ - 2 = 2	16. ____ - 4 = 5
17. ____ - 1 = 4	18. ____ - 2 = 4		

An EEI Lesson for 3rd - 5th Grade Students with Learning Disabilities:
The "Say-Do" Strategy to Improve Multiplication
by
Daniel Coburn, Beth Harrison, and Cheryl Martin

Note: This lesson is designed to support students with learning disabilities in mathematics. The auditory and kinesthetic aspects of the "Say-Do" tactic adds sensory information. The repetition and cognitive rehearsal allows students to think about the problem. **Self determination** components include decision making (deciding which problems to attack first), problem solving (deciding how to solve the problem either with manipulatives or mentally), goal setting (accurately completing 20 problems in 45 minutes), self-evaluation (checking the number right and wrong), and self-awareness (I am aware of what areas I am strong in and what areas I need help in.) For students with learning disabilities who also may be learning English as a Second Language, the lesson includes **SDAIE (**Specifically Designed Academic Instruction in English) strategies such as Sheltered Instruction, use of *realia* (manipulatives), explicit teaching of thinking skills (advancing to higher levels of Bloom's Taxonomy from knowledge recall to evaluation).

Arizona Standard: Mathematics Standard 1: Number Sense

Students develop number sense and use numbers and number relationships to acquire basic facts, to solve a wide variety of real-world problems, and to determine the reasonableness of results.
ESSENTIALS (Grades 4-6)
IM-E3 Understand the meaning for and application of the operations used in multiplication
IM-E5 Demonstrate proficiency with the operations of multiplication and division of single digit numbers
PO2 Solve problems using a variety of mental computations and estimation

Short Term Instructional Objective

Given teacher made worksheets of single digit multiplication problems, the student will complete them with 90% to 100% accuracy within a 45-minute class period as monitored by teacher inspection of student work over 2 consecutive grading periods.

ANTICIPATORY SET

Who is looking forward to graduating to junior high school? [Pause to check reactions, smile to indicate that you too are looking forward to their success?]

Today we are going to practice a skill that will help you pass the AIMS tests you need in order to go on to junior high school!

We are going to work on a multiplication. You'll be completing the worksheet by filling in the spaces that are missing. If you need help, raise your hand and I will come around to show you how these manipulatives might help you increase your accuracy (show them the manipulatives for those who may want to use them).

INSTRUCTION

Model: Okay, let's go through the first one together. [___ x 3 = 9] I want you to think what the question is asking you to do. Say out loud, "What number times 3 equals nine?" [Some students may say, "Something multiplied by 3 gives nine." Accept answers that are comprehensible.] *Tell me out loud what you will write on the blank space.* Paraphrase and coach until all students can answer "3."

Ready to do the remaining examples? Okay, now it's your turn.

Monitor as the students complete the worksheet. Listen for correct syntax as the students "read" the examples. Make corrections as needed.

Continue to monitor. For individual students who need extra assistance in understanding the multiplication process, do the following:

1. *Do you need some help?* [Teacher waits until student indicates help is requested.]

2. Okay, let's say this together "Some number multiplied (or times) this number equals (or gives me) this number." If student 'reads' correctly, move on.
3. If the student 'reads' incorrectly, correct the syntax, and demonstrate using manipulatives.
4. If the student still answers incorrectly, or not at all, skip the problem and go on to another one. Teacher will evaluate further to discover the pattern of incorrect responses.

Evaluate by having the students check their work as you read the answers. Allow students time to self-correct, encouraging them to continue to use the "Say-Do" tactic.

CLOSURE

Turn to your neighbor and take turns as you summarize what you've done today.

Show the students the graph and say, "Good job! I can tell by your hard work that you are making progress. THANK YOU!"

INDEPENDENT PRACTICE

Give worksheets for students to take home to practice for the next day.

References

Arizona Department of Education. (2000). Arizona Standards in Math: Number Sense. Retrieved from WWW Nov. 2, 2000. http://ade.state.az.us/standards/math/standard1.htm

Hunter, Madeline. (1982). Mastery teaching. California: Corwin Press, Incorporated. (ISBN: 0803962649)

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NAME _____ DATE _____ SCORE _____

1. _____ x 3 = 9	11. 1 x _____ = 0
2. 4 x _____ = 8	12. 6 x _____ = 30
3. _____ x 6 = 12	13. 7 x _____ = 21
4. 7 x _____ = 49	14. _____ x 9 = 27
5. 2 x _____ = 4	15. 9 x 9 = _____
6. 9 x _____ = 90	16. 3 x _____ = 3
7. 12 x _____ = 60	17. 7 x 4 = _____
8. 2 x _____ = 12	18. 12 x _____ = 120
9. 6 x _____ = 18	19. 6 x _____ = 42
10. 6 x _____ = 36	20. 8 x 2 = _____

An EEI Lesson for 7th & 8th Grade Students with Learning Disabilities in Reading Comprehension: Using the RIDGES Mnemonic to Solve Story Problems in Math

by

Rebekah Dyer, Nancy Kane, and Julia Munoz

Note: This lesson was designed for younger teenage students with learning disabilities in reading comprehension. Students' success in solving math word problems or story problems is dependent upon good reading comprehension. The RIDGES mnemonic helps students use their reading comprehension at the same time as it develops a strategy to solve problems. By using auditory rehearsal (reading the problem aloud) and drawing a picture to represent the problem, students also tap into other learning styles. **Self determination** skills that are tapped in this lesson include self-instruction skills and problem-solving skills. In addition, for those students with learning disabilities who are also learning English as a Second Language, the lesson includes **SDAIE (**Specifically Designed Academic Instruction in English) strategies such as Sheltered Content Instruction because there is a continuous review of the main topic (solving story problems), key vocabulary and ideas. Students also gain practice by having to paraphrase, define and model what they are thinking out loud.

Arizona Standard Mathematics Standard 6: Mathematical Structure/Logic Students use both inductive and deductive reasoning as they make conjectures and test the validity of arguments.

ESSENTIALS (Grades 4-6)

PO 1. Design a method with a series of defined steps for solving a problem; justify the method.

Mathematics Standard 1: Number Sense

IM-F3: Understand the meaning for and application of the operations of addition, subtraction, multiplication, and division.

PO 7. Solve word problems using the appropriate operations.

IM-F3. Distinguish between relevant and irrelevant information

PO 1. Select the information necessary to solve a given problem.

IM-FS4. Identify and use money (bills/coins) in real world.

Short Term Instructional Objective

Given 5 story problems, the student will apply the RIDGES mnemonic technique with 80-100% accuracy in a one hour period, as observed by teacher- or paraprofessional-inspection of the student's completed worksheet.

ANTICIPATORY SET

Focus Question: How many of you want a quick and easy way to be better math problem solvers? [Pause to check for answers, smile and go on.]

Today you'll learn an easy step-by-step process to increase your ability to solve story problems and to be more successful in applying what you already know about math.

INSTRUCTION

Pretest without RIDGES First let's find out what you already know how to do when solving math story problems. Please write down your answers to this problem:

- Mrs. Sanchez made an apple pie and cut it into six pieces. Isabel ate one piece of the pie. What fraction of the pie did Isabel eat?
- Isabel ate another piece of pie. Now what fraction has she eaten all together?
- What fraction of the pie is left for others to eat?

[Teacher monitors to discover patterns for solving the problems.]

Thank you! Now we'll learn what RIDGES can do to help us be better problem solvers.

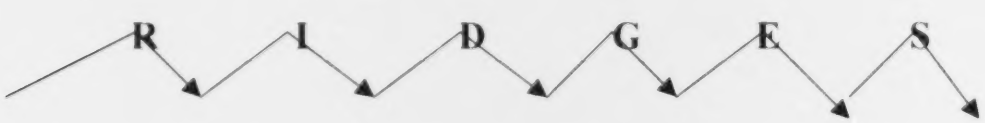
First I want you to WRITE IN BIG LETTERS THIS WORD in a vertical line on your paper.

R
I
D
G
E
S

Then I want you to write down what each letter stands for. It is a step in the way you'll do your math story problems.

R stands for Read the problem for understanding. [Be sure to ask for help if you don't know all the words you are reading.]
I stands for I know statements. [Write down all the things you know about the problem.]
D stands for Draw a picture. [The picture helps you understand what the problem says.]
G stands for Goal statement declaring in writing [Tell what I want to know.]
E stands for Equation development. [Write an equation that tells the story with numbers.]
S stands for Solve the problem.

Thank you for writing your own RIDGES. Now let's read the RIDGES together out loud. [Repeat several times.] Some of you might want to make a visual of a mountain ridge. This might help you remember RIDGES as a picture in your mind. Make the mountain ridge and place a letter at each mountain top.



Model Watch me as I show you how to use RIDGES for two types of problems.

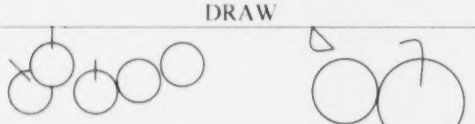
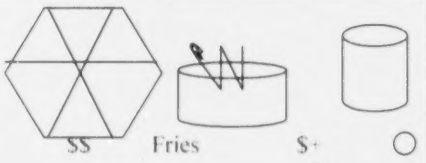
Primary Example	Intermediate Example
Johnny has 5 apples. Tammy gave him 2 more apples. How many apples does Johnny have in all?	Barry has $5.00 to spend for lunch. Last week Barry spent $10. 00 for lunch. Barry wants to buy pizza and fries for $2.00 and he wants a coke for $1.50. Does he have enough money? How much money will he have left?

IF I am using RIDGES, what should I do first? **(YES...READ the problem.)**

What will you do next? (YES....I know statements....)

Primary Example I know statements	Intermediate Example I know statements
I know 'gave' = addition. All together = addition Johnny = 5 apples Tammy = 2 apples	I know Barry has $5.00 I know he wants pizza & fries for $2.00 I know he wants a coke for $1.50.

Then what will I do? (YES...Draw a picture....)

Primary Example DRAW	Intermediate Example DRAW
 Johnny's Apples Tammy's Apples	 $$$$$ $$ Fries $+ .50

And then what's next? (YES...say I want to know....

Primary Example I want to know statements	Intermediate Example I want to know statements
How many apples in all?	Does he have enough money? How much will be left? [I'll have to subtract.]

And then what do I do? (YES...Equation development).

Primary Example Equation Development	Intermediate Example Equation Development
5 + 2 = ___?___ Or 5 + 2	$5.00 OR $2.00 -2.00 +1.50 $3.00 is left after the pizza & fries. $3.50 -1.50 $5.00 $1.50 is left after the coke. -3.50 $1.50

And then.... **(YES...Solve the problem.)**

Primary Example Solve the Problem	Intermediate Example Solve the Problem
Johnny has 7 apples all together.	Yes, he has enough money. He has $1.50 left.

Alternative Plan: Teach RIDGES in 3 lessons. Do R & I in lesson 1 using preview and review. Then D & G, and do a cumulative review of RIDG. Then E & S, using cumulative review of all 6 steps.

Monitor and Adjust

Now you are on your own. Complete your story problems and I'll come around to watch you use RIDGES.

CLOSURE

Now let's look at what you did for the pretest. Can you see how you have IMPROVED? Good job! You're really showing that you understand these word problems!

INDEPENDENT PRACTICE

Have several types of word problems ready to hand out for independent practice. Students can make up their own word problems to share with each other. Or they can practice so that they could teach RIDGES to a younger sibling at home.

References

Arizona Department of Education. (2000). Arizona Standards in Math: Number Sense. Retrieved from WWW Nov. 2, 2000. http://ade.state.az.us/standards/math/standard1.htm

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NAME _____ DATE _____ SCORE _____

Directions: Use RIDGES to solve these problems. Be sure to show all your work. Remember that showing your work 'counts' on the AIMS test you'll be taking for graduation.

1. Tony got five dollars from his mom for mowing the front yard. He went to the candy store with his friend Tom. He bought a blow pop for $.50, a candy bar for $.75, and some gum for $.99. After that, they went to Circle K. Tony bought two icees for himself and Tom. They were $1.24 each. How much money did Tony have left?

2. Ashley's dog had seven puppies. Her parents said she could keep one of the puppies. She sold two of the puppies to her cousin for $20.00 each. She sold three of the puppies in front of the grocery store for $50.00 each. The puppy she sold to a friend at school for $15.00. How much money did Ashley make from selling her puppies?

3. Susan went to the store to buy a six-pac of soda pop. She drank one on the way home. What fraction of the six-pac did Susan drink? Susan's brother drank one soda pop when she got home. What fraction of the six-pac did they drink altogether? What fraction of the six-pac is left?

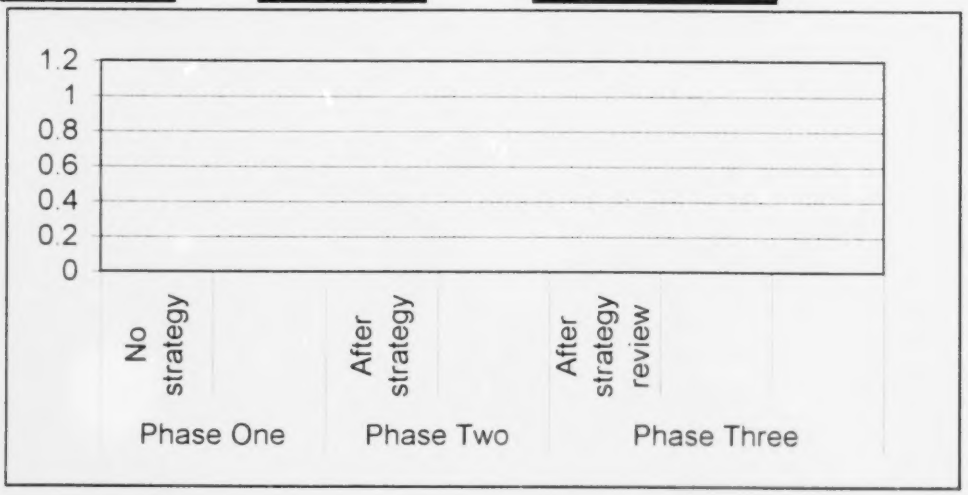
DATE:
TEACHER:

AZ Standard: Mathematics Standard 6: Mathematical structure/Logic-PO 1.B.

Phase One
No strategy

Phase Two
After strategy

Phase Three
After strategy review



An EEI Lesson for 9th Grade Students with Mild Mental Retardation:
Using Mnemonics to Solve Math Word Problems
RIDGES and Does McDonalds Sell Cheese BurgeRs?
by
Ann Calvert, Serena Comella, and Susan George

Note: This lesson is designed for 9th grade students with mild mental retardation. Students with MMR may also experience learning disabilities in mathematics. This lesson helps to meet their special learning needs because it provides step-by-step instruction with frequent review as well as an auditory reminder (mnemonic) to give clues for the process. The teacher provides prompt and consistent feedback in a supportive atmosphere that creates opportunities for success (and this success helps build self-esteem). The lesson incorporates activities that support different learning styles (visual, auditory, kinesthetic). The **self-determination** skills that are developed in this lesson include knowing strengths, needs and preferences; ability to deal with conflict; being persistent to realize success; using a self-instruction and self-correction method; building self-confidence in solving problems. For students who may also be learning English as a Second Language, this lesson includes **SDAIE (**Specifically Designed Academic Instruction in English) strategies such as using added resources and strategies to help students access the core curriculum, having students paraphrase, define, and model using English, explicit definitions of key vocabulary (e.g., mnemonic, acronyms, RIDGES and mountain ridge).

Arizona Standard Mathematics Standard 1: Number Sense Students develop number sense and use numbers and number relationships to acquire basic facts, to solve a wide variety of real-world problems, and to determine the reasonableness of results.
FOUNDATION (Grades 1-3)
IM-F6: Add and subtract commonly used fractions and decimals.
PO.2: Add and subtract money up to $5.00

Arizona Standard Academic/Workplace Skills Standard 2: Relate basic operations to one another (multiplication and division are inverse operations). Represent the process of multiplication as repeated addition, and division as repeated subtraction.
Standard 3 Demonstrate proficiency with the operations of multiplication and division of whole numbers.
ESSENTIALS (Grades 4-8)

Short Term Instructional Objective
Through the use of simple mnemonic strategies, students will identify and complete the proper steps to take when solving a given number of math problems at 85%-100% accuracy within a specified time frame as observed by teacher inspection of the completed work.

ANTICIPATORY SET

When is the last time you spent some money? Did you know how much change you should get? Would you like an easy way to remember how to solve problems like this?

Today you'll learn RIDGES and Does McDonalds Sell Cheese Burgers? which are two different ways to help you be better problem solvers.

INSTRUCTION

Assess Prior Knowledge Teachers can watch students complete a pretest using math story problems that require various operations. Be alert to what the students do as they solve the problems. Ask, "What are the ways that you figure out how to solve problems like this?" [Write down on the board what they say. Make a check mark by those strategies that are similar to RIDGES steps!]

Say, Good! You already have some great strategies.

Hand out the RIDGES cue sheet. Now you will have one more tool in your problem solving tool box. It's called RIDGES. Let's read together what the letters R I D G E S stand for in this mnemonic.

Model Now let's apply RIDGES to a problem. [Have several word problems printed on 3x5 index cards (color coded for levels of difficulty) and ask a student to choose one at random for the class to solve together.]

Read the problem. "Andre had $1.47 to spend. He spent $.37 on gum. How much does he have left?"

What are some "I know statements" [Listen as the students explain. Write down what they say.] I know he has $1.47. He already spent $.37.

Draw a picture. [Ask for a student volunteer to draw a picture on the board.]
Picture will need to include pictures of coins as well as dollar bills.

Goal statement. [What do we want to know?] Accept all answers but only write down the ones that are 'correct' e.g., "What does he have for change?" "How much is left?"

Equation development. [Does anyone want to volunteer to write the equation? Tell me what to write.]
$1.47
-.37

Solve the equation. [What's the answer? YES $1.10.]

Guided Practice Good job! Now it's your turn. Do 2 of the following problems on your own. I'll come around to check your work.

Monitor and Adjust Circulate to check for understanding. Make corrections as needed.

CLOSURE

Let's take a moment to assess this lesson. Count the number of story problems you've done correctly. Can you calculate your own scores? Go ahead and do that!

Good job!

Now let's all recite together the steps in RIDGES. [Listen to make sure all are participating. If time permits, allow several students to state the RIDGES out loud.]

Now, are you ready to practice a different mnemonic? YES? I'm glad you like this way of becoming better problem solvers!

INDEPENDENT PRACTICE

Have a variety of word problems ready for practice. Allow students the option of creating word problems to solve with RIDGES.

	Read the problem for understanding You may want to read it 2 or 3 times. Be sure you understand what you are reading. Look up the definitions of unfamiliar words. Ask a friend or the teacher!
	I know statements. List all information given in the story problem.
	Draw a picture. Keep it simple.
	Goal statement. Declare in writing what you want to know.
	Equation development Write a math equation that tells the problem in numbers.
	Solve the equation! Plug in the necessary information to reach the goal and solve the equation.

NAME _____ DATE _____ SCORE _____

1. Andre had $1.47 to spend. He spent .34 on gum. How much does he have left?

R

I

D

G

E

S

2. Mary needs to buy milk, eggs and bread. How much will she pay for these 3 items? The store is having a sale where milk is $2.39, one dozen eggs cost $1.39 and wheat bread is $1.79.

R

I

D

G

E

S

3. At Tolleson High there are 2,878 males and 1,943 females enrolled. By how many students must the enrollment increase to make the enrollment 5,000?

R

I

D

G

E

S

4. Sam has $10.00. He wants to eat at McDonalds. If Sam buys a BigMac, large fries and a large coke, how much change will he receive? Today's prices at McDonalds include this deal: BigMac for .99 Large fries for 1.89 and Large coke for 1.49.

R

I

D

G

E

S

5. If I have $25.00, and I put gas in my car, how many gallons of gas can I buy if the price of gas is $1.499 per gallon?

R

I

D

G

E

S

6. John has $4.00 in his bank at home. He received $5.00 more for doing chores. What is the total amount of money John has in his bank now?

R

I

D

G

E

S

Mnemonic #2: Does McDonalds Sell Cheese BurgeRs?

ANTICIPATORY SET

How many of you think long division is easy? How many of you think it is hard?

We'll learn how "Does McDonalds Sell Cheese Burgers?" helps us remember the order of operations that we go through for division problems! This will make long division easy for everyone!

INSTRUCTION

Write on the board or overhead transparency:

Does (**D**ivide) **M**cDonalds (**M**ultiply) 4x 1 = 4 **S**ell (**S**ubtract) 6-4 = 2 **C**heese (**C**heck) Can 2 go into 4? **B**urger**R**s (**B**ring down) 5 **R**emainder) Etc.	163 R. 0 4 6 5 2 -4 25 -24 12 -12 0

Model and demonstrate the correct procedure, emphasizing the order of operations.
Check for questions. Solicit comments about the procedure so students will not feel threatened or stressed out over this mnemonic.

Guided Practice Have students work long division problems on the board so they can be observed (by teacher and classmates) for correct application and computation process. This could be game-like if students rotated from one problem to the next, each doing the next step in the mnemonic in unison.

After the demonstration, then have the students complete problems at their desks. **Monitor and assist** as needed. Reinforce the steps of long divison by repeating both the mnemonic and the step (operation) it calls for.

CLOSURE

Post Test Have students complete problems on the board or at their desk. Check for correct application and computation process. Monitor correct responses on a frequency graph that each student keeps on her himself.

Ask students to summarize the mnemonic and the operations.

CONGRATULATE students on learning by using a mnemonic to remember the order of operation in long division problems.

INDEPENDENT PRACTICE

Have a series of division problems on worksheets or 3x5 cards that the students can draw from at random.

NAME _____ **DATE** _____ **SCORE** ____

Directions: Use the mnemonic "Does McDonalds Sell Cheese BurgeRs?" to practice these division problems and make sure you correctly follow the order of operations for long division . Please show all your work.

Divide
Multiply
Subtract
Check
Bring Down –Remainder

1. 4 divided by 652

2. 6 divided by 2935

3. Write your own long division problem here. Solve it!

References

Arizona Department of Education. (2000). Arizona Standards in Math: Number Sense. Retrieved from WWW Nov. 2, 2000. http://ade.state.az.us/standards/math/standard1.htm

Hunter, Madeline. (1982). Mastery teaching. California: Corwin Press, Incorporated. (ISBN: 0803962649)

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An EEI Lesson for 10th Grade Students with Specific Learning Disabilities in Mathematics and who are Learning English as a Second Language:
Using Mnemonics for Problem Solving
by
Kelly Buck, Annemarie Lampright, and Donald Rand

Note: This lesson is designed for students with specific learning disabilities in mathematics who often have problems with spoken language (such as delays, or discrepancies in listening and speaking), and reasoning (such as difficulty in organizing and integrating thoughts). The RIDGES mnemonic is both visual and auditory and uses a step-by-step procedure. In addition, for those students with learning disabilities who are also learning English as a Second Language, the lesson includes **SDAIE** (Specifically Designed Academic Instruction in English) strategies such as engaging in actively using English terminology, using resources and strategies to help students access the core curriculum, thinking skills such as asking questions. **Self determination components** are encouraged in this lesson. For example the student must use decision-making (problem solving) skills and communication skills (paraphrasing). Self instruction and self regulation are also skills that are emphasized in this lesson.

Arizona Standard Mathematics Standard 3: Number Patterns, Algebra and Functions Students use algebraic methods to explore, model and describe patterns, relationships and functions involving numbers, shapes, data and graphs within a variety of real-world problem solving situations.

Mathematics Standard 1: Number Sense
IM-F3. Understand the meaning for and application of the operations of addition, subtraction, multiplication and division.
IM-F1 PO2. Identify a whole number represented bya model with a word name and symbol.

Language Arts Standards in listening, reading comprehension, writing, and written comprehension are also emphasized in this lesson.

Short Term Instructional Objective

Given the student's current knowledge base, the student will apply the mnemonic strategy and its 6steps in this lesson RIDGES to solve 4 mathematical word problems at 75%-100% accuracy during one 45-minute class period as measured by teacher observation and correction of the paper by the ASU West intern.

ANTICIPATORY SET

Ask, would you like to learn a new clever way to solve word problems that might help you achieve greater success on the AIMS test you have to take for graduation? Today I'll teach you RIDGES, a mnemonic that helps you remember 6 steps to improving your success on solving math word problems.

INSTRUCTION

First let's be sure we understand some key vocabulary for this lesson.

Can anyone tell me what the word 'solve' means? [Choose a student and define.] Thank you.

Now who wants to tell me what an 'equation' is? [Choose a student and define.] Thanks!

Now we are ready to learn how to solve a math word problem. This is a secret to success called RIDGES.

RIDGES is a special kind of mnemonic called an **acronym.** Acronyms are unique to the English language. An acronym is a word that is formed by using the first letter of keywords. Sometimes the acronym forms another word (like RIDGES or SCUBA) and sometimes the acronym forms a sentence.

A mnemonic is a memory device. Mnemonics help us remember because they help stimulate more parts of our brain. Sometimes a mnemonic can be visual, sometimes it's auditory. In this case RIDGES can be both (for example when you hear the word ridge, can you picture a mountain ridge in your mind?)

Are you READY to hear what the letters in R I D G E S stand for?

R	**READ** and understand the details.
I	**I KNOW** statements.
D	**DRAW** a picture of the details.
G	**GOAL**. Write what you want to know.
E	**EQUATION**: Write a 'number sentence.'
S	**SOLVE** the equation.

Guided Practice Let's evaluate your initial understanding. Please recite the steps of the strategy. [Pause for choral recitation.] Now double check with your neighbor to be sure s/he knows the 6 steps of RIDGES. Listen while the peer with the longest hair goes first. Then take turns. [Pause while all exchange.] Please do the first problem on the RIDGES story list with your partner as you BO"TH practice using all 6 steps. Be sure to show all your work!

Monitor and Adjust Teacher circulates to observe students applying RIDGES. The teacher looks for:

1. Are the students using the RIDGES steps?
2. Are they choosing the correct operation (addition, subtraction, etc.)?
3. Is the answer correct?
4. Are they self-correcting?
5. Are the partner teams equally responsible for their work?

After about 5 minutes, ask for a volunteer 'teacher assistant team' to walk the class through the process. [Be sure to choose volunteer partners whose work indicates successful application!] Tell the students to make corrections on their own work as the teacher assistant proceeds.

CLOSURE

Thank you! Now let's briefly summarize. Please walk me through the steps.
What does R stand for? I? D? G? E? S?
Say, GOOD! You've been careful listeners. Now you are ready to do the problems on your own.

INDEPENDENT PRACTICE

Please complete these word problems between now and Friday. We'll have a RIDGES festival with the word problems you generate. Have fun with this!

References

Arizona Department of Education. (2000). Arizona Standards in Math: Number Sense. Retrieved from WWW Nov. 2, 2000. http://ade.state.az.us/standards/math/standard1.htm

Hunter, Madeline. (1982). Mastery teaching. California: Corwin Press, Incorporated. (ISBN: 0803962649)

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NAME _____ DATE _____ SCORE _____

Directions. Use RIDGES to solve these word problems. Show all your work!

1. Jon is mowing his lawn which covers an area of 1500 square feet. The width of the lawn is 50 feet. What is the length of the lawn?

The RIDGES Mnemonic	Show Your Work
R = READ and understand the details. **I = I KNOW** statements. **D = DRAW** a picture of the details. **G = GOAL**. Write what you want to know. E = **EQUATION**: Write a 'number sentence.' **S SOLVE** the equation.	

2. The garden is surrounded by a fence which has a perimeter of 160 feet. The area that is inside the fence is considered to be the garden. If the garden is a perfect square, then what is the surface area of the garden?

The RIDGES Mnemonic	Show Your Work
R = READ and understand the details. **I = I KNOW** statements. **D = DRAW** a picture of the details. **G = GOAL**. Write what you want to know. E = **EQUATION**: Write a 'number sentence.' **S SOLVE** the equation.	

3. In a football game, Jimmy ran for 150yards on 25 carries. How many yards did he gain per carry?

The RIDGES Mnemonic	Show Your Work
R = READ and understand the details. **I = I KNOW** statements. **D = DRAW** a picture of the details. **G = GOAL**. Write what you want to know. E = **EQUATION**: Write a 'number sentence.' **S SOLVE** the equation.	

4. Mark MacGuire in 1998 hit a homerun for every 19 at bats. If Mark MacGuire hit70home runs, then how many at bats did he have?

The RIDGES Mnemonic

R = READ and understand the details.

I = I KNOW statements.

D = DRAW a picture of the details.

G = GOAL. Write what you want to know.

E = **EQUATION**:
Write a 'number sentence.'

S SOLVE the equation.

Show Your Work

More problems:

5. Jake Plummer throws for 334 yards and 2 touchdown passes. Jake had 41 pass attempts and completed 24 of them. What was Jake Plummer's average number of yards per completion?

6. Rick drives 30 miles to work each day after school 5 days a week. Rick only uses the car for work. How many miles does Rick travel to and from work per week?

7. The volume of a swimming pool is 1600 cubic feet. The perimeter of the pool is 60 feet. The length is 20 feet. Find the width and average depth of the pool.

8. Danielle has $150.00 in her bank account to spend at the mall. She owes her brother $16.75 for a book and she owes Brenda and Mary $7.50 each for lunch last week. If Danielle pays her debts, and buys a new pair of shoes for $45.00 and a blouse for $23.65, then how much money will she have left in the bank?

Extra Credit: Make up your own word problem to bring to the Friday RIDGES Festival. It has to be interesting and one that will make RIDGES useful. If it has 2 operations (addition, subtraction, multiplication, division), then you get 20 extra credit points. If it has 3 operations, you get 30 extra credit points. If it has all 4 operations, you get 50 extra credit points.

Madeline Hunter's Essential Elements of Instruction

Arizona State University West

5-Step Lesson Design

Dr. Barbara Jacquette DCI 302

Madeline Hunter's Five Step Lesson Design

Terminal Objective [Arizona Standard]

Instructional Objective [Correct Level of Difficulty: IEP Short Term Instructional Objective]

1. SET
   - A. Active Participation
   - B. Relevancy
   - C. Past Experience
   - D. State Objective .

2. INSTRUCTION
   - A. Pre-Test (if necessary
   - B. Provide Relevant Information
   - C. Model
   - D. Check for Understanding

3. GUIDED PRACTICE
   - A. Elicit Active Overt Responses
   - B. Provide Error Correct
   - C. Knowledge of Results

4. CLOSURE
   - A. Final Assessment of Objectives
   - B. Mental Summary by Students

5. INDEPENDENT PRACTICE
   - A. Homework or Seatwork
   - B. Monitor

Considerations Throughout the Lesson

RETENTION

REINFORCEMENT (Age Appropriate)

MOTIVATION (Age Appropriate)

ACTIVE ARTICIPATION

MONITOR AND ADJUST

Special Features

Adapt for ESL

Adapt for Type of Disability